FRITSCH

Operator’s Manual

Vibratory Sieve-Shaker "analysette 3"

and

Vibratory Micro-Mill "pulverisette 0"

Fritsch GmbH
Manufacturers of Laboratory Instruments
Industriestraße 8
D - 55743 Idar-Oberstein, Germany

Phone: +49 (0)6784/ 70-0
Fax: +49 (0)6784/ 70-11
E-Mail: mailto:info@fritsch.de
Internet: http:www.fritsch.de

Fritsch GmbH, Manufacturers of Laboratory Instruments, was certified by the TÜV on June 22, 1994

TÜV CERT DIN EN ISO 9001

An audit has confirmed that Fritsch GmbH complies with the stipulations of DIN EN ISO 9001.

The attached declaration of conformity specifies the directives that the vibratory sieve shaker “analysette 3” and the vibratory micro mill “pulverisette 0“ must satisfy before they are permitted to bear the CE conformity mark.

CE

Instrument number 03.7020.00
applies as of serial number 2019

Instrument number 03.8020.00
applies as of serial number 2114

Instrument number 00.6020.00
applies as of serial number 215

Edition 10/2001 Index 005

Table of Contents **Page**

1 General Information/Introduction 1
1.1 Notes regarding the operator's manual 1
1.2 Explanation of symbols on sieve shaker and in operator's manual 1
1.3 Brief description of the sieve shaker 3
1.3.1 Sieve shaker "3", model PRO 3
1.3.2 Sieve shaker "analysette 3", model SPARTAN 3
1.3.3 Vibratory micro mill "pulverisette 0" 3
1.4 Set-up and method of operation 4
1.4.1 Set-up 4
1.4.2 Method of operation 4
1.4.3 Regulating the amplitude 4
1.5 Technical data 5
2 Operational Safety 6
2.1 General safety instructions 6
2.2 Operators 7
2.3 Safety guards 7
2.4 Danger areas 7
2.5 Safety and electricity 7
2.5.1 General information 7
2.5.2 Protection against restart 7
2.5.3 Overload protection 7
3 Installation 8
3.1 Unpacking 8
3.1.1 Shipping guard: 8
3.2 Transport 8
3.3 Erection 9
3.4 Electrical connection 9
3.4.1 Adjustment to the mains 9
4 Preparing the Work with the Instrument 10
4.1 Preparing for sieving 10
4.1.1 Stacking and fastening the sieves 10
4.1.2 Multiple sieving 11
4.1.3 Substance to be sieved during dry or wet sieving (Sieves 200 mm in diameter) 11
4.2 Dry sieving 12
4.2.1 Sieving parameters 12
4.2.2 Sieving aids 12
4.3 Wet sieving 12
4.3.1 Sieving parameters 12
4.3.2 Wetting agents 12
4.3.3 Supplying the flushing agent 13
4.3.4 Recovery of the undersize particles 13
4.3.5 Tips on wet sieving of substances that are difficult to sieve 14
4.4 Sieving with micro-precision sieves 14
4.4.1 Sieving parameters 14
4.4.2 Quantity of substance to be sieved 14
4.4.3 Stacking the micro-precision sieves 15
4.4.4 Wet sieving with micro-precision sieves 16
4.5 Grinding with pulverisette 0 16
4.5.1 Parameters 16
4.5.2 Erecting the grinding mortar 17
4.5.3 Grinding with liquid nitrogen 18
5 Operating the instrument 19
5.1 Activating 19
5.2 Deactivating 19
5.3 Standby 19
5.4 Setting the sieving or grinding time 20
5.5 Displaying the amplitude 20
5.6 Interval of time 20
5.7 Storing and accessing the settings 20
5.8 Micro-precision sieving 21
6 Cleaning 21
6.1 Cleaning the instrument 21

6.2 Cleaning the analysis sieves (woven mesh sieves) 21
6.3 Cleaning the micro-precision sieves 22
6.4 Cleaning the grinding elements 22
7 Accessories 23
7.1 Program autosieve 23
7.2 Connecting the sieve shaker to the serial interface 23
7.3 Sound insulation hood 23
7.4 TorqueMaster 24
7.4.1 Parts 24
7.4.2 Placing and bracing the sieves with the TorqueMaster 25
7.4.2.1 Preparing for the tensioning process 25
7.4.2.2 Tensioning 26
7.4.2.3 Release 26
7.4.3 Operation 27
7.4.4 Maintenance of the TorqueMaster 27
7.4.5 Compatibility 27
8 Maintenance 28
9 Warranty 28
10 Checklist for Troubleshooting 28

1 General Information/Introduction

1.1 Notes regarding the operator's manual

- Hereafter, the vibratory laboratory sieve shaker "analysette 3" and the vibratory micro mill "pulverisette 0" will be referred to simply as the sieve shaker and the micro mill, respectively.
- Fritsch GmbH, Manufacturers of Laboratory Instruments, retains the proprietary rights to these technical documents.
- This operator's manual is only to be reprinted or copied with the permission of Fritsch GmbH, Manufacturers of Laboratory Instruments.
- The operator's manual must be studied carefully.
- The operators must be familiar with the operator's manual.
- Comply with all instructions pertaining to your safety.
- The sieve shaker was designed with user safety in mind, but residual risks cannot be excluded. The suggestions in this manual must be complied with to avoid risk to the users. The symbols in the right-hand margin highlight the risks detailed in the text.
- Some symbols are also used on the sieve shaker, where they warn of possible risks.
- Warning symbols are surrounded by a triangle.
- This operator's manual is not a complete technical description. It describes only the details necessary for operation and to main functionality

1.2 Explanation of symbols on sieve shaker and in operator's manual

Attention! Warning: Danger zone Comply with operator's manual	
Attention! High voltage	
Attention! Risk of explosion	
Attention! Hot surface	
Attention! Flammable materials	

Warning: Risk of injury to hand	
Wear protective gloves	
Wear ear protection	
Wear eye shield	
Do not walk under suspended load	
With water squirt forbidden	

1.3 Brief description of the sieve shaker

1.3.1 Sieve shaker ”3“, model PRO

The "analysette 3" is a vertically vibrating laboratory sieve shaker employed for the precise separation and classification of grain sizes. It can be used to analyse the size of dry powders and of particles suspended in a liquid as well. Depending upon the quantity to be sieved and the particle size distribution, sieves and pans of different diameters and heights can be placed on the sieve shaker.

- Dry and/or wet sieving is possible with metallic woven mesh sieves as well as with galvanically produced micro-precision sieves.
- It features a large number of functions such as electronic amplitude regulation, amplitude display, ability to specify the length of the interval in advance, ability to micro-sieve and the standby function.
- A serial interface permits cooperation with the computer program AUTOSIEVE. This cooperation satisfies the stipulations in DIN ISO 9000 for precisely defined testing.
  Refer to the attached leaflet for the capabilities of the computer program AUTOSIEVE.
- **It is not advisable to convert the “analysette 3“ PRO into the micro mill “pulverisette 0" because the disruptions caused by the impact of the balls would render the amplitude regulation useless. The “analysette 3“ SPARTAN is better suited for this purpose.**

Attention!
Should you use the PRO model with the grinding head "pulverisette 0", please see to it that the amplitude is not set > 2mm as this will lead to damages at the instrument for which Fritsch does not accept the liability for.

1.3.2 Sieve shaker “analysette 3”, model SPARTAN

The “analysette 3" SPARTAN has the same structure as the PRO model but with fewer functions. It does not possess the serial interface, the amplitude display, the ability to specify the length of an interval in advance, the ability to micro-sieve, or the standby function.
It is easy to convert the vibratory sieve shaker into the micro mill "pulverisette 0". Therefore it can also be utilized for very fine grinding of laboratory samples.

1.3.3 Vibratory micro mill “pulverisette 0”

The mortar bowl with grinding balls (diameter 50 mm or 70 mm [only with agate]) and grinding stock is caused to oscillate vertically. As a result, the grinding balls in the mortar bowl vibrate, thus comminuting the substance through impact and friction.
To avoid unwanted contamination by fines during the grinding process, grinding sets (mortar bowls and grinding balls) of six different substances are available. In addition, with the “pulversiette 0” it is possible to grind in liquid nitrogen.

1.4 Set-up and method of operation

1.4.1 Set-up

The mechanical set-up of the instrument is clearly perceptible from the drawings of the replacement parts in the service manual. It would be a good idea to refer to them during the following technical explanations.
The plastic casing contains a solid cast element with an electronically control electromagnet. Three permanent-elastic leaf springs support its pole flange with the vibrating plate fastened to it. When the magnet is activated, pole flange and vibrating plate are attracted – and spring back when it is deactivated. Cast element and magnet on one side and pole flange, vibrating plate and sieves on the other side form a vibration system.

1.4.2 Method of operation

The different quantity of sieves and grinding stock or top-mounting particles changes the natural frequency of the vibration system. Consequently, it is not always possible to set the sieve shaker optimally, e.g. to a constant 50 Hz line frequency. The sieve shaker's processor-controlled electronic system ensures a precisely adjustable, reproducible sieve amplitude. This is achieved by bringing the amplitude closer to or further away from the natural frequency of the system.
The desired amplitude of vibration of the sieve stack is between 0.1 mm and 3.0 mm. It can always be achieved with relatively low expenditure of energy. Consequently, permanent operation is possible without the sample and the entire sieving system warming up

1.4.3 Regulating the amplitude

An electronic control circuit reduces the sieving frequency from a high to a low range. In this process, a measurement system acquires the amplitude and reports it to the control circuit until the preset amplitude is reached.
This amplitude regulation occurs at regular time intervals throughout the complete operation to enable response to changes in the sieving system.

1.5 Technical data

Dimensions and weight

Dimensions: 350 x 200 x 400 mm (width x height x depth)

Net weight: 21 kg

Noise during operation

The noise level is 65-82 dB (A). This value fluctuates in response to frequency, grinding stock and sieving aids being used

Voltage

The instrument can be operated in two voltage ranges:

- Single-phase a.c. voltage 115 V ± 13% and
- Single-phase a.c. voltage 230V ± 13%.

It is not necessary to switch from one to the other manually.

Power consumption

Depending on the line voltage, the maximum consumption of voltage is in the ranges:

- 115 V..... 0.44 A
- 230 V..... 0.22 A

Wattage

The maximum wattage is 50 W.

Electric fuses

Fuse under mains switch (back of instrument)
Replacement: wire fuse 4 A M, 5 x 20 mm

Load

The maximum load consisting of both sieves and substance to be sieved must be less than 6 kg (see Chapter 4 Preparing the Work with the Instrument).

Sieve mesh widths that can be used (sieve shaker)

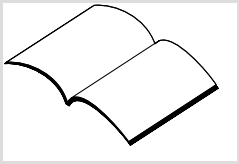
- Dry sieving 100 µm to 25 mm (without sieving aids)
  from 32 µm (with sieving aids)
- Wet sieving from 20 µm
- Micro-sieving 5 µm to 100 µm

Final fineness (micro mill)

The attainable end fineness of the ground stock is about 5 to 10 µm (depending on the grinding capability of the sample and how long it is ground).

2 Operational Safety

2.1 General safety instructions



- Read the operator's manual carefully.
- Operate the instrument only for the purpose described in Chapter 4 Preparing the Work with the Instrument.
- Use only original accessories and original replacement parts. Failure to do so may call the safety of the sieve shaker into question.
- The main switch of the instrument is mounted on the back of the instrument. The space behind the instrument must be readily accessible so that the switch can be reached quickly in the event of danger.
- The operators must be familiar with the contents of the operator's manual.
  As one of the steps to ensure this, keep the operator's manual with the instrument.

- Do not remove any information signs.
- During all work, strictly obey all accident prevention rules.
- Any unauthorized modifications of the instrument result in loss of the Fritsch's declared conformity with European directives and render the warranty null and void.
- If the fines exceed a certain percentage, there is a risk of self-ignition (dust explosion) when grinding or sieving substances that can oxidise, e.g., metals, organic substances, wood, coal, plastics, etc. Consequently, special safety precautions (e.g., wet grinding or wet sieving) must be taken and the work must be supervised by a specialised expert.
- In addition, the MAC values of the applicable safety regulations must be complied with. If necessary, steps must be taken to ensure ventilation or the instrument must be operated under an exhaust vent.
- The instrument is only to be operated indoors. The ambient air is not to contain any dust that would conduct electricity.
- The instrument is not designed with explosion protection and is not suitable for grinding or sieving explosive, combustible or fire-promoting substances.

2.2 Operators

- The instrument is to be operated by authorized persons only and must be maintained and repaired by trained specialists.
- No one is to operate the instrument while under the influence of health problems, medication, drugs or alcohol or if over-tired.

2.3 Safety guards

Safety guards such as covers are to be used as intended and are not to be rendered out of order or dismantled.
Do not loosen or tighten tightening belts or clamping screws unless the instrument is turned OFF.
Before switching on please assure that the toothed belts are tightened strongly and symmetrically through the knurled knobs.

2.4 Danger areas

- Risk of being pinched or squashed in the sieve tightening system.
- Risk of being pinched or squashed between vibrating plate and housing.

2.5 Safety and electricity

2.5.1 General information

Turning OFF the mains switch results in two-pole isolation of the instrument from the mains.

2.5.2 Protection against restart

After the instrument is turned OFF at the mains switch and then back ON, the START button must be pressed to put the instrument back in service.

2.5.3 Overload protection

The mains fuse protects against overloads.

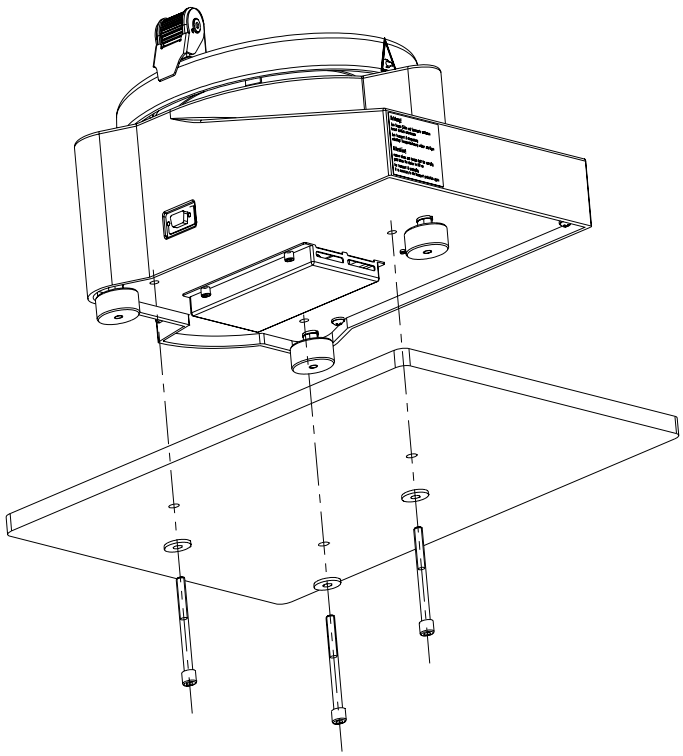
3 Installation

3.1 Unpacking

- Open the shipping crate at the top and remove all packed components.
- Compare the contents of the shipment with your order.

3.1.1 Shipping guard:

Loosen and completely remove three hex head cap screws under the wooden panel.



Attention:
Keep wooden panel, screws and washers because these shipping guards must be re-installed if instrument transported again or returned.

3.2 Transport

All sieves or grinding elements must be removed for carrying. Mains plug must be unplugged at the mains connection combination on the back of the instrument. Grasp instrument on both sides at the level of the middle of the sieving plate and pick it up.

Attention:
Do not put your hands under the plate or use the tightening belt to pick up the instrument. The spring-mounted suspension could destroy important components of the instrument.

For shipping relatively long distances, it is imperative that the shipping guard be re-installed to brace the spring-mounted components.

3.3 Erection

- Place the instrument on a flat, stable surface indoors. It is not necessary to anchor it in position.
  Leave enough space to place the sieves next to the instrument.
  The area behind the instrument must be readily accessible so that the main switch can be reached quickly in the event of an emergency.
- The sieve shaker stands on three spring-loaded feet. Level it by screwing these feet in and out so that the substance to be sieved will be uniformly distributed over the entire sieving surface.
- Ambient conditions:
  - → Operate only indoors
  - → Temperature range 5 to 40°C
  - → Humidity 80% at 31°C to 50% at 40°C
  - → Elevation up to 2000 m above mean sea level
  - → Instrument must stand on a stable, flat and vibration-resistant surface
  - → Instrument complies with over voltage category 2 as defined in IEC 664.

3.4 Electrical connection

Before connecting the instrument, compare the values for voltage and current specified on the nameplate with those of your mains.

3.4.1 Adjustment to the mains

Only specialists are to change over the voltage ranges on the instrument.

Attention!!
If the values 06 or 07 set for 230 V~, this will cause a fault in the sieve shaker during operation.
"NO WARRANTY IF SETTINGS ARE INCORRECT"

1. Set main switch to "0".
2. While holding down Stop button (keyboard), turn the instrument ON at the main switch. The instrument is now in the "Set-up mode".
3. The display "Sieving Time" now indicates the presetting "04" to 230 V, "06" to 115 V. For a house voltage of 100 V (in Japan) the value is preset to "07".
4. These values can be changed with the +/- keys "Sieving Time" and adjusted to the house voltage.
   230 V 04
   115 V 06
   100 V 07
   The set value is automatically stored.
5. After the adjustment, turn the main switch back OFF.

4 Preparing the Work with the Instrument

4.1 Preparing for sieving

4.1.1 Stacking and fastening the sieves

You can stack as many as

- sieves 50 mm (or 2") tall or
- sieves 25 mm (or 1") tall

on the vibrating plate between the sieve pan (collecting vessel) and sieving head

The combination of sieves and sieve pan is referred to as a sieve stack.

1. The sieves (in ascending mesh size, i.e. finest sieve at the bottom) are placed loosely in one another with gaskets between each until the sieve stack is complete.

Attention!!!
The mesh size of the sieves must increase from bottom to top.
For instructions as to appropriately stagger the sieve mesh sizes and to conduct a sieve analysis, refer to:

- the standard DIN 66 165, Parts 1 and 2,
- the program AUTOSIEVE and/or
- our application technology laboratory.

2. Loosen the tension belt system as much as possible.
3. Move the lever on the small tension block down and guide the toothed belts out through the fastener from the inside (Figure 1).
4. Place the sieving tower with sieve pan on the rubber pad of the vibrating plate.
5. Place the substance to be sieved on the top sieve.
6. Put the sieving head on in such a manner that the inner rubber surface seals the circumference of the sieve.
7. Hook the tension belt systems onto the sieving head.

Figure 1

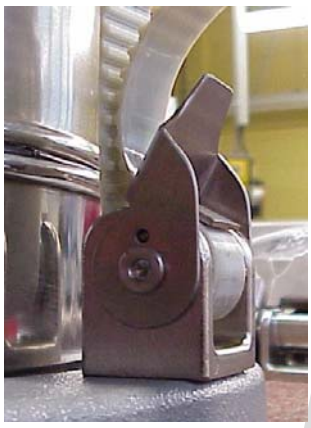


Figure 2

8. Pull the toothed belts tight (Figure 1) and insert them into the teeth of the block.
9. Move the tightening lever to the position shown in Figure 2. Note that the tightening lever with the hole in it locks into a thrust piece in the block.
10. Uniformly tighten the sieving tower by turning the tension belt system clockwise until the toothed belts are stretched tight.

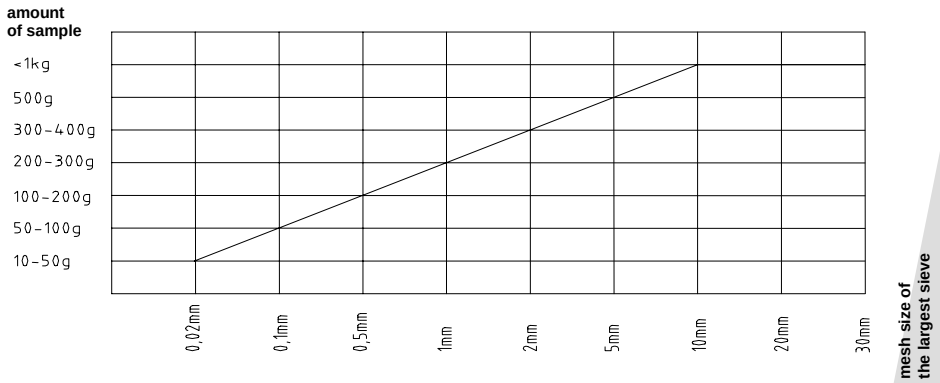
If the 2 toothed belts are not tightened evenly, the substance to be sieved may not be able to disperse evenly over the surface of the sieve.

4.1.2 Multiple sieving

Due to the special configuration of the dry sieve pan, it is possible to execute two or three sieving operations (two or three sieve stacks, one over the other) in a single step.

4.1.3 Substance to be sieved during dry or wet sieving

(Sieves 200 mm in diameter)



Maximum load :	Substance to be sieved < 1 kg Sieves and substance to be sieved < 6 kg

4.2 Dry sieving

For dry sieving, use the dry sieve pan (without an outlet) and the dry sieving head.

4.2.1 Sieving parameters

Parameter	Coarse grain	Fine grain
Sieving time	3 to 20 min	15 to 30 min
Amplitude	2.5 to 3 mm	1.5 to 2.5 mm

To achieve the target amplitude of 3mm (full amplitude), at least 3 sieves, the collecting vessel and sieve cover must be fastened to the sieve shaker. If fewer sieves are used, it may not be possible to achieve a target amplitude of 3mm (full amplitude). In this case, the regulation of the sieve shaker can no longer attain the optimal operating point; the sieve shaker vibrates at a lower amplitude and frequency. The target amplitude must in this case be lowered accordingly. Once the machine has warmed up, the target value can under some circumstances be increased accordingly.

4.2.2 Sieving aids

To shorten the sieving time, you can place so-called sieving aids in every sieve with mesh sizes larger 32 µm. During sieving, the balls impact on the sieves and accelerate the removal of the substance being sieved.

You can use the following as sieving aids

- **Agate balls**
  10 mm ∅: 10 balls per sieve, Order no. 55.0100.05
  or
- **Rubber balls**
  20 mm ∅: 5 balls per sieve, Order no. 31.0180.15

4.3 Wet sieving

Caution!!
Do not use any easily ignited, flammable liquids such as ketones or benzenes with a boiling point <120°C.

For the wet sieving, use the wet sieve pan (with outlet and discharge hose) and the wet sieving head. Refer to the replacement parts drawings in the appendix to see drawings of the individual replacement parts mentioned below.

Pour the substance to be sieved, making certain that it disperses as well as possible, onto the top sieve and clamp the wet sieving head.

Make certain that the gasket in the cover seals well.

Do not let any liquids into the instrument.

4.3.1 Sieving parameters

Parameter	Average	Percentage of fine particles
Sieving time	3 to 10 min	approx. 15 min
Amplitude	2 to 2.5 mm	

4.3.2 Wetting agents

Wetting agents enhance dispersion.

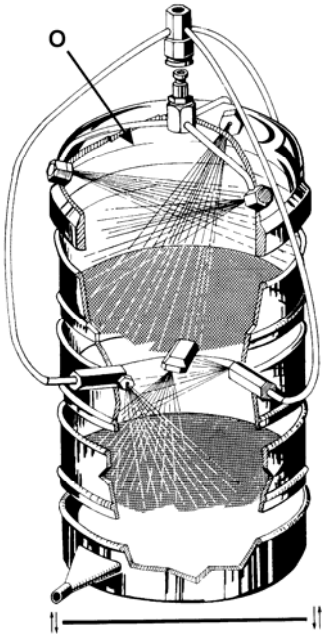
- Add tenside in liquid form (flushing agent, imbentine, etc.) in small quantities only (in drops) to avoid foaming

- Add inorganic or organic salts such as sodium phosphate or sodium lauryl sulphate and polysalts in quantities of 0.1 – 0.5%.

4.3.3 Supplying the flushing agent

To add the flushing agent, connect a hose (with hose clamp) to the quick-release coupling on the wet sieving head.
Add just enough water or alcohol to avoid backpressure damming) in the sieve stack.
The maximum quantity of liquid is limited by the 3 nozzles on the sieving head (approx. 1.5 l at approx. 2 bar).
Make certain that the liquid flows evenly out of the wet sieve pan – this is an indication that substance being sieved and the liquid are well dispersed.
If the flow of liquid ceases, this indicates backpressure in a sieve. Stop the flow of liquid and check if your sieves are plugged. The overpressure that develops in the sieving tower due to the backpressure can destroy the woven mesh of the sieve.
Make certain that the small opening (O) in the wet sieving head is open – otherwise it cannot prevent overpressure from developing and possibly a break in the woven mesh.
You can also add wetting agent through this opening (O) in the wet sieving head, since this will wash back out during a protracted sieving time.

4.3.4 Recovery of the undersize particles



To recover the fines from those from the bottom sieve, you can connect the discharge hose to, for example, a suction filter.

Tip:
Clean water coming out of the sieve pan indicates that the sieving is over.

Do not permit any liquid into the instrument.

4.3.5 Tips on wet sieving of substances that are difficult to sieve

- When wet sieving substances that are difficult to sieve, reduce the quantity of substance to be sieved and select sieves with a narrower range of mesh sizes.
- Turn ON the interval, sieving time 3 to 5 sec.
- When sieving on the top sieve is finished (no undersized particles remain), take off the sieving head, remove the top sieve and fasten the sieving head on the next sieve. As a result, the jets are concentrated directly on the substances on the next sieve. Following this procedure, you can sieve each individual sieve in the tower while exerting a direct effect with the water jets. The jets are arranged such that the substance being sieved is flushed from the circumference of the sieve to the centre. During this process, the sieving head ("Plexiglass" cover) is also sprayed and is kept free of substances.
- To avoid backpressure on a lower sieve while wet sieving substance that is difficult to sieve, interpose a sieving ring over this sieve.
  After this ring is connected to the hose system, additional liquid is sprayed in through three nozzles, thus counteracting any backpressure (damming). These nozzles are positioned so that they spray onto the sieving surfaces above and below the sieve in question. This also causes the substance being sieved to move in a circle.
  If necessary, you can also place another interposed sieving ring above any sieve that tends to become clogged.

4.4 Sieving with micro-precision sieves

4.4.1 Sieving parameters

Parameter	1 micro-precision sieve	max. 4 micro-precision sieves
Sieving time	20 to 30 min	60 min
Amplitude	0.1 to 0.2 mm	0.5 mm

4.4.2 Quantity of substance to be sieved

Depending on the distribution of particle sizes and the size of the sieve holes, you can sieve a maximum of 200 mg (in the case of coarse sieves: from 100 µm to 1 gram). Utilize trial and error to ascertain the suitable amount to be sieved.

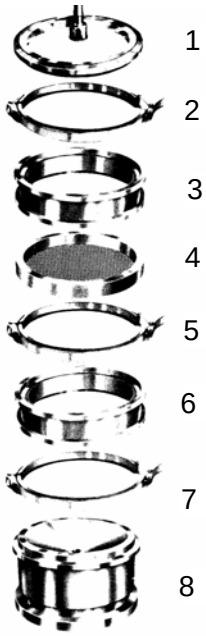
Attention:
The instrument must be in the MICRO operating mode. The MICRO lamp must light up. Otherwise the sieves may be destroyed.

In the MICRO operating mode, the amplitude is limited so that only values between 0.1 and 0.5 mm can be selected.

4.4.3 Stacking the micro-precision sieves

Refer to the replacement part drawings in the appendix for drawings of the individual components mentioned below.

- Turn the rubber gasket on the vibrating plate until you can see three caps. Under the caps are three threaded holes.
- Remove the caps and bolt the hopper (sieve pan) to the centre of the vibrating plate with the spanners and knurled screws. The three spanners rest on the bottom edge of the hopper and the vibrating plate.
- Lock the hose in place with a hose clamp.
- Turn the sieve shaker ON in the MICRO operating mode.
- Afterwards, fill the hopper and spacer ring up to the gasket with liquid and position the first sieve **with the sieve foil side down,** crooked at first so that the air under the sieve can escape.
- Place another spacer ring on the sieve and fasten the two spacer rings to one another with a fast locking ring.
- If you wish to work in the sieving tower with a number of sieves, install the next sieves in the same manner and fill each sieve with liquid before putting on the following one.
- Fasten the sieve cover to the top sieve with a fast locking ring.
- Use a hose clamp to connect a hose to the coupling on the sieve cover.

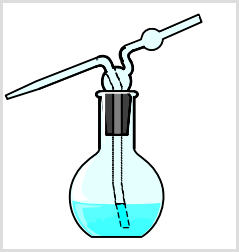


1	sieve cover with nozzle
2	fast locking ring
3	spacer ring with 2 gaskets
4	micro-precision sieve
5	fast locking ring
6	spacer ring with 2 gaskets
7	fast locking ring
8	hopper (sieve pan) with outlet

Clamp on a maximum of 4 sieves

4.4.4 Wet sieving with micro-precision sieves

Remove the cover and pour onto the cover the substance in suspension that you wish to sieve. You can spray the liquid in through the nozzle in the cover. Keep in mind, however, that the consumption can drop radically after the sieve has been used for a long time and that you will have to adjust the amount of liquid.



Spraying the liquid in with a spray bottle is a tried-and-tested method. With this method you can very selectively whirl up the substance to be sieved and accelerate the progress of sieving (= sieving without sieve cover).

When sieving in the top sieve has been concluded, lower the level of the liquid to the level of the sieve foil, close the outlet again and remove sieve cover, spacer ring and sieve.

Afterwards, either replace the cover, fasten it in place and screen with the following sieve, or continue to work with the spray bottle with the cover.

Do not turn the sieve shaker off during these steps.

Transfer the sieve into weighed glasses (flush off) and dry.

Attention:
The sieving tower must remain filled with liquid during the entire sieving operation. The sieve foils are not to run dry, otherwise this may destroy them.

Tip:

Torn sieve foils can be point-soldered from the bottom with soft solder.

Do not let any liquids into the instrument.

4.5 Grinding with pulverisette 0

4.5.1 Parameters

Length of grinding	10 to 30 min (average)
Amplitude	1 to 2 (max.) mm
Quantity of grinding stock	max. 10 ml (grain size ≤ 5mm)

4.5.2 Erecting the grinding mortar

- Place the grinding mortar on the vibrating plate. The mortar must sit straight in the round recess – do not tilt it.
- Unscrew the tension belt systems as far as possible (away from the toothed belt).
- Pour in the grinding stock
- Put on the cover
- Hook tension belt systems on cover

Figure 3

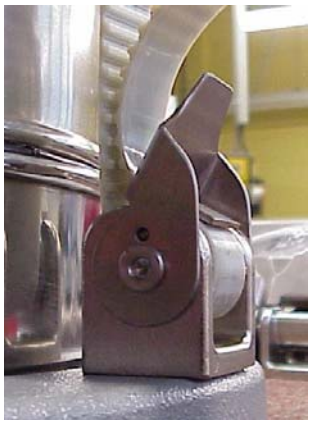


Figure 4

- Guide the toothed belts through the fastener and tighten (Figure 3). Run the toothed belts up into the teeth of the block.
- Set the tightening lever as shown in Figure 4 Note that the tightening lever with the hole locks into a thrust piece in the block.
- Tighten the sieving tower until it is uniformly tightened by turning the tension belt system clockwise until the toothed belts are uniformly tightened.

During grinding, select an amplitude at which the balls vibrate. You will achieve the best grinding results at the lower to middle amplitude (1 mm to max. 2 mm) because the impact frequency of the grinding balls is greatest then.

Attention:
Avoid amplitudes at which the grinding balls bounce high. Begin grinding at a low amplitude and increase it slowly. Do not select too high an amplitude.

There is a risk that the grinding balls may destroy the cover.
You can pour the grinding stock into the mortar bowl while substance is dry or in suspension.

Do not let any liquid into the instrument.

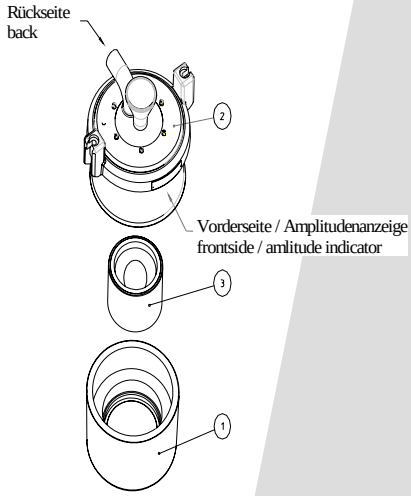
4.5.3 Grinding with liquid nitrogen

Attention!
Grinding with liquid nitrogen is only possible with grinding accessories made of stainless steel, tungsten carbide and zirconium oxide.

When grinding in liquid nitrogen to embrittle the substance being ground, it is advisable to use the device especially designed for grinding in nitrogen (Item no. 00.2000.00). In this heat-insulated instrument the grinding vessel and the grinding balls can be cooled dramatically before grinding. Very little liquid nitrogen has to be added during the grinding process.

Attention!!!
Comply with ZH 1/119, Chapter 5.4.6 in particular, and all other pertinent regulations and notices dealing with the handling of liquid nitrogen. Wearing suitable protective clothing, especially protective glasses and thermal gloves, is mandatory. Work just with the lowest possible amounts. The laboratory must have adequate ventilation.

The bottom pot is placed on the vibrating plate and the mortar with ball and grinding stock are placed in the plastic mount. The top pot is then placed on the bottom pot such that the gasket in the top pot is touching the edge of the mortar, the tube is pointing to the rear and the amplitude indicator forward. The instrument is then clamped in place like a normal sieving tower (see Chapter 4.1 Preparing for sieving)

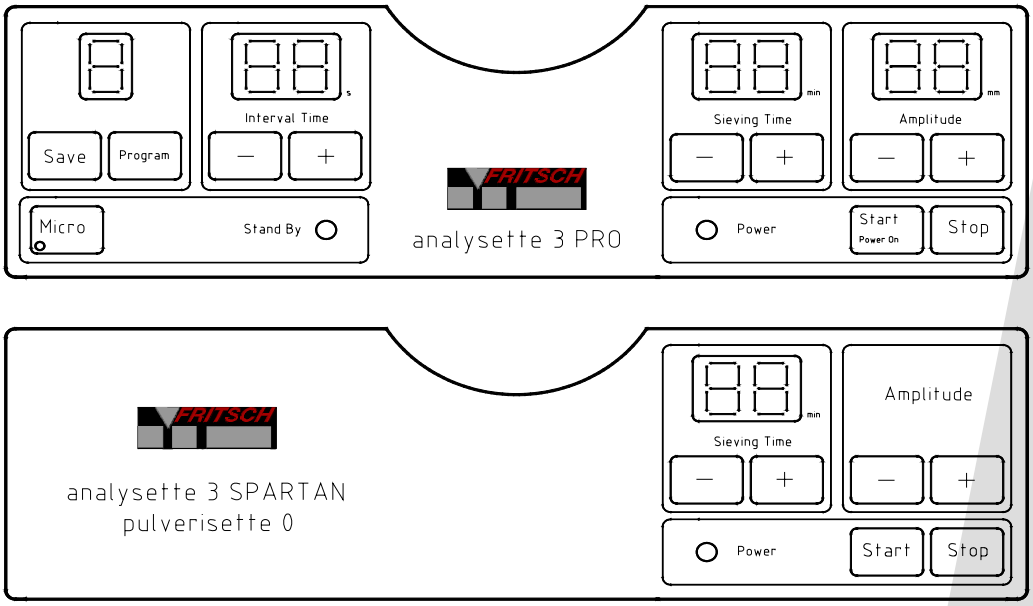


Liquid nitrogen is then carefully poured through the hopper. It evaporates immediately and flows out through the tube. The boiling nitrogen can be viewed through the macrolon inspection glass. Continue to add liquid nitrogen only until the amount of vapour flowing out the tube decreases. The grinding elements have then been cooled down enough to start grinding. During this process, proceed as described earlier for normal grinding.
During grinding, continuously refill as much nitrogen as evaporates.

5 Operating the instrument

Please take into account that some of the functions described are not available with the “analysette 3 SPARTAN” and the “pulverisette 0”.

5.1 Activating



After the mains switch on the back of the instrument is turned ON, the pilot light POWER lights up. The displays indicate the basic setting. Pressing the START button turns the instrument ON.

5.2 Deactivating

Pressing the STOP button turns the instrument OFF. If the instrument will not be operated for a protracted period of time, turn the instrument OFF at the mains switch.

5.3 Standby

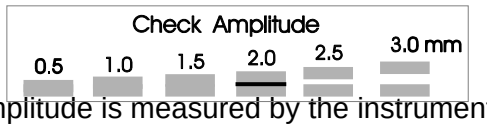
If the instrument is not operated for about an hour, it switches to the current saving mode (STANDBY). Only the STANDBY lamp lights up. Pressing the START button switches into the normal mode. The POWER lamp lights up; the STANDBY lamp goes OFF.

5.4 Setting the sieving or grinding time

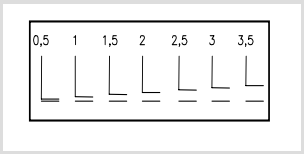
The sieving or grinding time can be set in increments of one minute with the + / - keys. Values between 1 and 90 minutes are possible. Let the instrument cool down after it has been running for 1 hour.
To set continuous operation, hold the “-“ down until “P” or “00” appears in the display.
Selecting the amplitude:
The vertical vibration amplitude can be set in steps of 0.1 mm with the + / - keys. Values between 0.1 and 3 mm are possible.
If you press the MICRO key (MICRO lights up), you can set an amplitude between 0.1 and 0.5 mm.

5.5 Displaying the amplitude

After the instrument has been started the actual amplitude is displayed above the amplitude setting.
When the sieving or grinding process is over, the display indicates the set amplitude.
In addition, the amplitude can also be checked on the sign on the sieving head. The lines, which seem to touch, indicate the set amplitude.
The principle is based on the sluggishness of the human eye.
Example of 2 mm amplitude:



The amplitude is measured by the instrument at regular intervals and is corrected if necessary.



5.6 Interval of time

The duration of the sieving intervals can be selected in one-second steps with the + / - keys. The pause is always one second long.
Continuous operation is set if the “-“ key is held down until “P” or “00” appears in the display.
Due to the pauses in sieving, the sieving process is accelerated greatly when sieving a substance that is particularly light (e.g. grain or plastic) because, during the sieving pause, light material can fall through the stationary sieve mesh and drop onto the next finer sieve fraction.

5.7 Storing and accessing the settings

The settings of the amplitude, sieving time/grinding time, interval length and MICRO ON/OFF can be stored. 9 memory locations are available for this purpose.
Save settings: Push the SAVE key.
Access settings: Press the PROGRAM key.
When the PROGRAM key is pressed, 9 memory locations appear in succession and the settings are displayed.

5.8 Micro-precision sieving

After the MICRO key is pressed, a pilot lamp lights up in the key and the amplitude is set to 0.1 mm. You can now select an amplitude of max. 0.5 mm. Pressing the MICRO key again turns OFF the limit.
The instrument cannot be switched to MICRO when it is turned OFF.

Attention!!!
If the instrument is running at settings of one of the memory locations 1 to 9, you cannot change any setting during operation. If PROGRAM 0 is shown in the display, the settings can also be altered during operation.

6 Cleaning

6.1 Cleaning the instrument

You can wipe the instrument off with a damp cloth.

Do not let any liquids into the instrument.

6.2 Cleaning the analysis sieves (woven mesh sieves)

We recommend that you use our ultrasonic bath "**laborette 17**" to clean the sieves. Ultrasound baths with higher output can destroy the sieve mesh. Place the sieves in the cleaning agent straight up or head down.

Attention:
A brush can destroy fine woven mesh.
Use mechanical aids only if coarse sieves are involved.

With small mesh sizes there is a risk that the mesh will be moved and the mesh size will no longer be correct
If possible, clean the sieves after each use.
You can dry the sieves in a drying oven at max. 95°C (the drying time can be shortened by flushing sieves with alcohol).

6.3 Cleaning the micro-precision sieves

Use the ultrasonic bath "**laborette 17**" to clean the sieves:

- Place the micro-precision sieves in a thick-walled glass container containing cleaning agent (e.g. water with tensides or alcohol in a 5 litre beaker with walls about 3 mm thick).
- Immerse the sieve in the cleaning agent **sieve foil side up.**
- Place the beaker with sieve into the wire basket in the ultrasonic bath.
- Before turning the ultrasonic bath ON, check the level of the liquid in contains: it must be about 3 to 5 cm below the edge of the bath to ensure good coupling of the ultrasonic energy.
- Rinse sieves with alcohol and let them air dry. Drying possible at max. 40°C.

Attention!!!

- **Be very gentle with sieves.**
- **Direct ultrasound can destroy the sieves.**
- **Do not subject the precision sieves to ultrasound in the bath for over 3 minutes.**

6.4 Cleaning the grinding elements

Clean the mortar bowl and grinding balls after each use: e.g. brush clean under running water with conventional cleaning agents.
It is permissible to clean the elements in the ultrasonic bath.

Attention!!!
Do not heat grinding parts above 100°C. **Cool them slowly and carefully.**
Agate parts must never be heated in the microwave (they heat up too rapidly).
They must never be subjected to temperature shocks, such shocks may destroy the parts → They burst apart explosively.

7 Accessories

7.1 Program autosieve

When used in combination with the program package AUTOSIEVE, the serial interface permits a computer to control all of the functions of the sieve shaker and to ensure the reproducibility of the sieving processes. The automatic evaluation of the sieving results has also proven to be a great worksaver. After the individual fractions are weighed, it is possible to display and store sieve results in a broad range of forms with the aid of the program package AUTOSIEVE and a scale.

7.2 Connecting the sieve shaker to the serial interface

Use the safety screws of the 9-pin Sub-D receptacle of the interconnecting cable accompanying the AUTOSIEVE program to connect the receptacle to the Sub-D plug connector on the sieve shaker.
Plug the other end of the interconnecting cable with the 9-pin connector into the serial interface of the computer.

7.3 Sound insulation hood

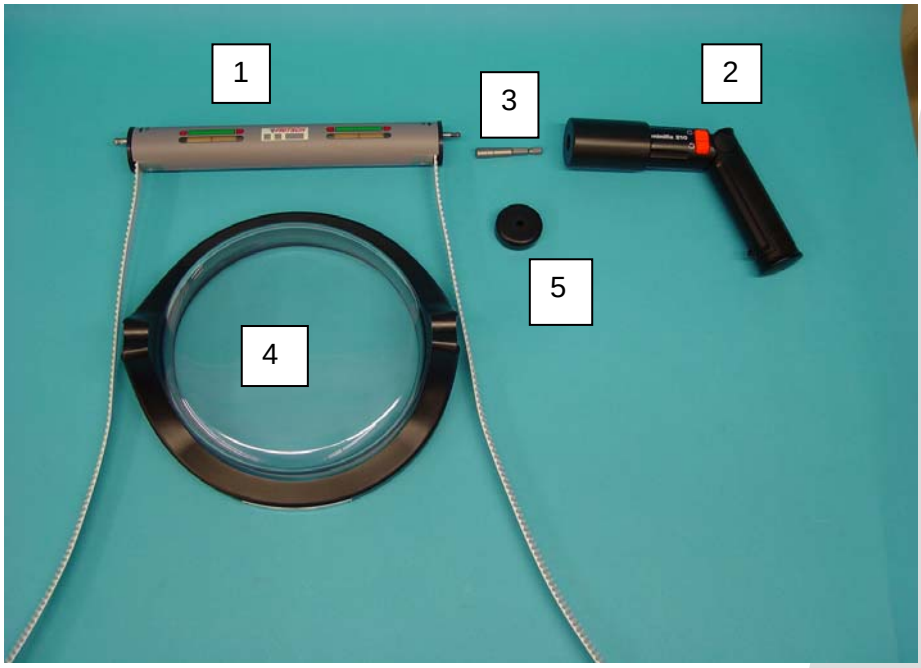
A sound insulation hood (Item no. 00.0130.17) is available to reduce the operating noise of the micro mill.

7.4 TorqueMaster

As an alternative to the standard tensioning process, the TorqueMaster can be used for quick and precise tensioning.

7.4.1 Parts

1	TorqueMaster tensioning unit with toothed belt
2	Cordless screwdriver (with battery and charger)
3	Bit (hexagon socket 5.5)
4	compatible strainer head
5	Emergency wheel



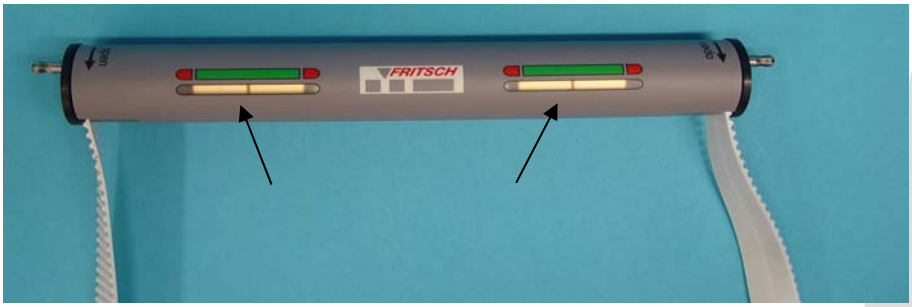
Attention:
The supplied emergency wheel should be used exclusively for releasing the tension of a sieve tower (if the cordless screwdriver malfunctions).If it is used for tensioning, there is no limit on the tightening torque – the malfunction and a possible destruction of the tensioning unit are thus, pre-programmed.

7.4.2 Placing and bracing the sieves with the TorqueMaster

The sieves are placed as described in Chapter 4.1.1 Stacking and fastening the sieves described with the following differences:

7.4.2.1 Preparing for the tensioning process

1. The starting position of the tensioning system is the position in which both the “indicators” are located more or less in the centre of the respective display area. This position ensures that sieve towers with varying heights can be tensioned subsequently without any problem and that a sufficient distance is available for detaching the system, lifting it from the sieve tower and placing it behind the instrument.



2. Insert the toothed belt in the tensioning block as described in Chapter 4.1.1-3.
3. Place the sieve tower and fill in the material to be sieved as given in Chapter 4.1.1-4/5.
4. Place the TorqueMaster strainer head (Chapter 4.1.1-6).
5. Place the tensioning unit on the strainer head. As far as possible, the tensioning unit must be “placed and operated symmetrically”. ***This symmetry can be ensured by setting and fixing the belt properly.***

6. Tighten the toothed belt on both sides and close the strap of the tensioning block as described in Chapter 4.1.1-8/9.
7. Ensure that both the indicators are more or less in their central positions.
8. You can now tighten the tensioning system with the cordless screwdriver.

7.4.2.2 Tensioning

A reproducible force of ~1kN is applied on the sieve cover right from the process of tensioning by the cordless screwdriver till its release
Tensioning processes, in which the sliding coupling of the cordless screwdriver does not get disengaged (due to any defect, dead battery or improper operation), fail to apply the required force. →***The right amount of tension force is applied only if the sliding coupling of the cordless screwdriver is disengaged during the tensioning process.***
The tensioning unit must be operated with a **definite** release torque of the operating device (cordless screwdriver).This torque must be set by the manufacturer of the tensioning system. Thus, no other cordless screwdrivers, other than those set by Fritsch may be used. The use of cordless screwdrivers with a very high torque could lead to irreparable damages to the tensioning system and no guarantee shall be given for the same.
If cordless screwdrivers with a very low torque are used, the sieve tower will be tightened with a very low tension force.

Attention:
Follow the manufacturer's operating manual for the cordless screwdriver. The manual is supplied with the instrument.
During tensioning, be sure to lift the TorqueMaster slightly (images 1+2).
If you do not apply light tension to the toothed belt, it well be pinched in the TorqueMaster (images 3+4)

Image 1

Image 2

Image 3

Image 4

7.4.2.3 Release

The tension can also be released with the cordless screwdriver.
The tension is released such that the tensioning unit can be placed behind the instrument ***without any change in the fixed toothed belt on the tensioning block***.
The tension of the belts on the tensioning block is released and/or adjusted only if the sieve tower settings are modified because of the number or height of the sieves.

7.4.3 Operation

During all functions, both the indicators of the tensioning unit must be located in the areas marked in green.
Should either or both the indicators move in the area marked in red, the following procedure should be followed.

Malfunction	Possible cause	Elimination of fault
Both indicators in the outer red area	Tensioning unit is opened too wide	Open the tensioning unit only slightly, it is possible that the belt is fixed too tightly, hence, it must be released by one tooth from both the sides on the tensioning block.
	Tensioning unit must be opened wide so as to enable deposition/ Tensioning unit not assembled as per the instructions	Assemble as per the instructions.
Both indicators in the respective inner red areas	Tensioning unit closed at a very wide distance / Tensioning unit not assembled as per the instructions	Assemble as per the instructions.
One indicator on one side in the red area	Tensioning unit assembled in a “very” asymmetrical manner	Assemble as per the instructions. Ensure symmetry while fixing the belt in the tensioning blocks.

7.4.4 Maintenance of the TorqueMaster

The tensioning unit is largely maintenance-free.
It can be cleaned with the usual solvent-free detergents.
The tensioning unit is more or less closed. Ensure that no fluids, dust, dirt or other foreign bodies enter the tensioning unit through the openings for the toothed belt.

7.4.5 Compatibility

The TorqueMaster must be used with toothed tensioning blocks (03.3120.00). Damage to the toothed belt can be avoided with a good design and through appropriate use of this combination.
Basically, TorqueMaster can also be used with the old tensioning blocks (03.1210.00). However, this combination leads to excessive wear and tear of the belt and hence, its use is not advisable.

8 Maintenance

Aside from routine cleaning, the sieve shaker and micro mill are maintenance-free.

Unplug the mains plug before starting any work in the instrument.

Unplug the mains plug and secure the instrument to prevent accidental reactivation.
When opening the instrument, keep in mind that capacitors inside may be conducting high voltage!

9 Warranty

The warranty card accompanying this instrument when delivered must be filled out completely and returned to the supply plant in order for the warranty to take effect. The option of online registration is available. For further information, please refer to your warranty card or visit our Homepage http://www.fritsch.de

FRITSCH GmbH Laboratory Instruments, Idar-Oberstein, Germany, its “Application Technology Laboratory” and/or the Fritsch representatives in your country will be pleased to provide advice and assistance.
If you have any questions, include the serial number that is printed on the nameplate of the instrument.

10 Checklist for Troubleshooting

Malfunction	Possible cause	To resolve problem
Lamp	No a.c. power	Plug in the mains plug
POWER	Main switch	Turn main switch ON
Won’t light up	Mains fuse blown	Change the mains fuse
	Line fuse of the wall outlet has blown	Turn ON breaker or change fuse in fuse box
Rattling noses	Tightening belts loose	Tighten the belts
Strong vibration	Sieving tower loose	Tighten the belts
Fluctuation around set point	Screws of rotating spider loose	Tighten the screws (8 Nm)
	Leaf springs faulty	Check leaf springs for cracks and, if necessary, exchange rotating spider
	Leaf springs too hot	Let springs cool down
Substance to be sieved doesn’t distribute uniformly	Tightening belts not uniformly tightened	Tighten tightening belts uniformly
over the sieving surface	Instrument not level	Re-level the instrument by twisting the feet